

**National Hydrogen and Fuel Cell Codes and Standards Coordinating Committee  
(NHFCCSCC)**

**Wednesday, December 6, 2023  
TIME: 2:00 PM ET**

**Minutes**

**Andrew Adkins  
Moye Ajao  
Nick Barilo  
Chris Boyer  
Chris Boyer  
Connor Dolan  
Brian Ehrhart  
John Eihusen**

**Mike Force  
Jennifer Gangi  
Jennifer Hamilton  
Tobias Hanson  
Laura Hill  
Will James  
Ian MacIntire  
Sara Marxen**

**Norm Newhouse  
Haboon Osmond  
Eric Prause  
Karen Quackenbush  
Mike Steele  
Kelvin Sumba  
Svetlana Ulemek  
Christine Watson**

**I. Welcome and Housekeeping Items**

- a. The NHFCCSCC reviewed FCHEA's Anti-trust Guidelines, approved previous minutes, and approved the meeting agenda.

**II. DOE/HQ Update**

**Christine Watson**

- Notice of Intent for Funding to Advance the National Clean Hydrogen Strategy: [DOE Issues Notice of Intent for Funding to Advance the National Clean Hydrogen Strategy | Department of Energy](#)
- Request for Information to Achieve Rail Sector Decarbonization: [Department of Energy Releases Request for Information to Achieve Rail Sector Decarbonization | Department of Energy](#)
- First DOE report on clean hydrogen production pathways, just announced at COP28: "Hydrogen Shot Technology Assessment: Thermal Conversion Approaches" [DOE Releases First in Series of Reports Highlighting Pathways Toward Clean Hydrogen EarthShot | Department of Energy](#)

**III. Codes & Standards Events and Fuel Cell Safety Information**

**Karen Quackenbush**

- Calendar of events: <https://www.hydrogenandfuelcellsafety.info/safety-report-calendar>
- Any committee members with materials they would like hosted on the website can send them to Karen Quackenbush ([kquackenbush@fchea.org](mailto:kquackenbush@fchea.org)) or Haboon Osmond ([hosmond@fchea.org](mailto:hosmond@fchea.org)).

**IV. Global Technical Regulations**

**Ian MacIntire**

- No update - nothing new to report regarding the NHTSA NPRM or GTR-13.

**V. Codes and Standards Organization Updates**

**Institute of Electrical and Electronics Engineers****Mark Siira**

- The revision process for the 2027 edition of IEEE 1547 continues.

**International Electrotechnical Commission IEC TC 105****Kelvin Hecht**

- Please [visit](#) the November 2023 edition of the Hydrogen and Fuel Cell Safety Report to read a report on the IEC/TC 105 Plenary Meeting.

**International Standards Organization ISO/TC 197****Karen Quackenbush**

- Please [visit](#) the November 2023 edition of the Hydrogen and Fuel Cell Safety Report to read a report on the ISO/TC 197 SC 1 Plenary and ISO/TC 197 Plenary Meetings.

**National Fire Protection Association NFPA 2****Chris LaFleur**

- NFPA 2 held a pre-first draft meeting on Tuesday, November 7th from 11-4 PM US Eastern Time.

**International Codes Council (ICC)****Mark Fasel**

- The code proposals have been approved for support by both the Fire Services Code Action Committee and PMG (Plumbing, Mechanical, and Fuel Gas) Code Action Committees as of November 14th, 2023, and will advance forward as supported code proposals to the 2027 editions of the International Fire Code and International Fuel Gas Code.
  - As a reminder anyone may submit a code proposal through the ICC Code Development process. Membership to the organization is not required to participate in the Code Development process.
  - Code proposals for the 2027 editions of the International Codes must be submitted no later than January 8th, 2024.
- The American Gas Association develops the content for Chapter 4 for pipe sizing. It has been brought to ICC's attention that based on the amount of H2 admixture with natural gas that traditional pipe sizing methodology for natural gas may need result in an increase in size dependent upon the amount of H2 admixture added for blending. AGA will provide additional sizing tables if determined necessary. If new sizing tables are not proposed for H2 admixture with natural gas, the following will continue to be the accepted sizing methodologies:
  - 402.3 Sizing. Gas piping shall be sized in accordance with one of the following:
    1. Pipe sizing tables or sizing equations in accordance with Section 402.4 or 402.5 as applicable.
    2. The sizing tables included in a listed piping system's manufacturer's installation instruction.
    3. Engineering methods.
- ICC continues to work with Standards Development Organizations CSA, ASTM, and NFPA to update codes and standards and strive to achieve international harmonization of standards when possible. If anyone has international standards, they list their products to or that may be suitable for installer credentials, please reach out to Mark Fasel via email at [mfasel@iccsafe.org](mailto:mfasel@iccsafe.org)
- ICC's goals for 2024 will be to develop jurisdictional permitting and plan review guidance for US Clean Hydrogen Hub projects, inspection checklists and best practice guidance documents for building and fire officials for H2 production, storage, distribution, and end use. Additionally, ICC will also seek to assist in the development and implementation of H2 installer credentialing to support safe installation and maintenance of H2 systems.

Task Force	Document	*	Title	Date	Status
Interface	J2600_201510	S	Compressed Hydrogen Surface Vehicle Fueling Connection Devices	21-Oct-15	Being revised in conjunction with ISO 17268
Interface	J2601_202005	S	Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles	29-May-20	Being revised
Interface	J2601/4	TIR	Ambient Temperature Refueling	21-Nov-16	Comment reconciliation under way
Interface	J2601/5	TIR	MC Formula High Flow General (MCF-HF-G) <i>(title may change)</i>	1-Jul-22	Ballot in process
Interface	J2799_201912	S	Hydrogen Surface Vehicle to Station Communications Hardware and Software	13-Dec-19	Ballot in process

Safety	J1766_201401	RP	Recommended Practice for Electric, Fuel Cell and Hybrid Electric Vehicle Crash Integrity Testing	10-Jan-14	Revised - Action required. Awaiting GTR 13 Phase 2
Safety	J2990/1_201606	RP	Gaseous Hydrogen and Fuel Cell Vehicle First and Second Responder Recommended Practice	3-Jun-16	Meeting scheduled to address comments
Safety	J3294	TIR	Guidance for Material Selection for use in Hydrogen Systems	20-Apr-23	Soliciting comments

CSA

Sara Marxen

Technical Committee Meetings	
<ul style="list-style-type: none"> <li>If you are interested in joining hydrogen standards development committees with CSA, please contact Iris Monner (<a href="mailto:iris.monner@csagroup.org">iris.monner@csagroup.org</a>)</li> <li>If you are interested in joining hydrogen fuel cell standards development committees with CSA, please contact Mark Duda (<a href="mailto:mark.duda@csagroup.org">mark.duda@csagroup.org</a>)</li> </ul>	
Active Projects	
Designation/Title	Status
HGV 5.2, Compact hydrogen fueling systems	This project is to develop a NEW standard for Compact Hydrogen Fueling Systems (HGV 5.2). Working with the TC and TSC Chairs to disposition ballot comments. A second ballot is expected in December.
HGV 5.1, Residential hydrogen fuelling appliances	This project is to develop a NEW standard for Residential fueling appliances. Content development continues.

HGV 4.3, Test methods for hydrogen fueling parameter evaluation	This project is a revision of an existing standard. Document has been revised for use as a certification document. Public review closed October 8, 2023. Meeting with TSC Chairs will be scheduled soon to review comments.
HGV 4.8, Compressors	This project is to revise an existing edition of HGV 4.8 compressor standard to address updates in compressor technology. We continue to seek compressor manufacturers to join the TSC. Please contact Sara Marxen ( <a href="mailto:sara.marxen@csagroup.org">sara.marxen@csagroup.org</a> ) if interested in joining this work.
B107, Enclosed Hydrogen Equipment	The draft has been posted for public review will be available for review until December 24, 2023.  Link to the CSA public review portal to view the CSA B107 draft: <a href="https://publicreview.csa.ca/Home/Details/5125">https://publicreview.csa.ca/Home/Details/5125</a>
B401.3, Hydrogen vehicle and trailer maintenance facilities code	This project is to start a new standard that will be aligned with existing maintenance facility requirements in CSA B401.1 (natural gas) and existing hydrogen requirements – BNQ 1784-000 and NFPA 2 and 30A. Please contact Iris Monner ( <a href="mailto:iris.monner@csagroup.org">iris.monner@csagroup.org</a> ) if interested in joining this work.
CHMC 1, Test methods for evaluating material compatibility in compressed hydrogen applications - Metals	This project is to revise the existing edition of CHMC 1 to address updates in testing methods and clarify requirements. The kick-off meeting is scheduled for December 14, 2023. Please contact Iris Monner ( <a href="mailto:iris.monner@csagroup.org">iris.monner@csagroup.org</a> ) if interested in joining this work.
FC 6 * C22.2 No. 62282-2-100, Fuel cell/water electrolysis module	CSA Group is developing the first edition of the binational CSA FC 62282-2-100 * C22.2 No. 62282-2-100 – Fuel Cell Technologies – Part 2-100: Fuel cell modules – Safety (IEC 62282-2-100, MOD). This project will be adopting IEC 62282-2-100 - Fuel Cell Technologies – Part 2-100: Fuel cell modules – Safety for US and Canada. The committee will be expanding the scope of the adoption to include water electrolysis modules including cell stacks as the requirements will be similar to fuel cell modules and there is an immediate industry need for a water electrolysis module safety standard. Contact Mark Duda ( <a href="mailto:mark.duda@csagroup.org">mark.duda@csagroup.org</a> ) with questions or for additional information.

## Compressed Gas Association (CGA)

Rob Early

*Updates from last month's report are highlighted.*

Status of current and future publications:

<b>Standard</b>	<b>Current edition</b>	<b>Status</b>
CGA G-5, <i>Hydrogen</i>	8 <sup>th</sup> (2017)	The ANS committee has resolved all proposed changes. Next step is a 45-day public review. <a href="https://portal.cganet.com/WorkItem/Details.aspx?id=22-019">https://portal.cganet.com/WorkItem/Details.aspx?id=22-019</a>
CGA G-5.3, <i>Commodity specification for hydrogen</i>	7 <sup>th</sup> (2017)	Deadline to submit proposed changes for next edition was 5/1/2023. A total of 7 PCs have been submitted. A PC resolution meeting is scheduled for 3 November 2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-013">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-013</a>
CGA G-5.4, <i>Standard for hydrogen piping systems at user locations</i>	6 <sup>th</sup> (2019)	Deadline to submit proposed changes for next edition is 12/22/2024. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-54">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-54</a>
CGA G-5.5, <i>Hydrogen vent systems</i>	3 <sup>rd</sup> (2014)	Deadline to submit proposed changes for next edition is 03/04/2026. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=26-3">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=26-3</a> The task force met 19 and 20 October 2023 to review test results.
CGA G-5.6, <i>Hydrogen pipeline systems</i>	1 <sup>st</sup> (2005 – reaffirmed 2013)	Deadline to submit proposed changes for next edition was 8/1/2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=19-018">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=19-018</a>
CGA H-3, <i>Standard for cryogenic hydrogen storage</i>	3 <sup>rd</sup> (2019)	This publication is in staff review prior to Council Ballot. After council approval, H-3 will be sent for 45 day public review after council approval to move through the ANS process.
CGA H-4, <i>Terminology associated with hydrogen fuel technologies</i>	3 <sup>rd</sup> (2020)	Deadline to submit proposed changes for next edition is 12/1/2024. However, all the content has been added to the updated version of CGA G-5. Once CGA G-5 has been issued, CGA H-4 will be retired. For updates use the following link: <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-59">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-59</a>
ANSI/CGA H-5, <i>Standard for bulk hydrogen supply systems</i>	3 <sup>rd</sup> (2020)	The deadline to submit proposed changes for the next edition is 2/26/2024. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-010">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-010</a>
CGA H-10, <i>Combustion safety for steam reformer operation</i>	2 <sup>nd</sup> (2018)	Deadline to submit proposed changes for next edition is 12/1/2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-038">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-038</a>

<b>Standard</b>	<b>Current edition</b>	<b>Status</b>
CGA H-11, <i>Safe start-up and shutdown practices for steam reformers</i>	2 <sup>nd</sup> (2020)	Deadline to submit proposed changes for next edition is 8/11/2025. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-30">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-30</a>
CGA H-12, <i>Mechanical integrity of syngas outlet systems</i>	1 <sup>st</sup> (2016)	Deadline to submit proposed changes for next edition is 6/1/2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-016">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-016</a>
CGA H-13, <i>Hydrogen pressure swing adsorber (PSA) mechanical integrity requirements</i>	1 <sup>st</sup> (2017)	Council ballot due 21 Aug 2023, IHC Association approvals due 18 Sept 2023. Pending no comments, estimated publish date by the end of September. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-027">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-027</a>
CGA H-14, <i>HYCO plant gas leak detection and response practices</i>	1 <sup>st</sup> (2018)	Deadline to submit proposed changes for next edition is 12/8/2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-045">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-045</a>
CGA H-15, <i>Safe catalyst handling in HYCO plants</i>	1 <sup>st</sup> (2020)	Deadline to submit proposed changes for next edition is 9/1/2025. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-59">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-59</a>
CGA H-17, <i>Small scale hydrogen production and delivery</i>	1 <sup>st</sup> (2023)	Publication has been issued. Deadline to submit changes for next edition is 9/20/2029. <a href="https://portal.cganet.com/WorkItem/Details.aspx?id=29-14">https://portal.cganet.com/WorkItem/Details.aspx?id=29-14</a>
CGA P-28, <i>OSHA process safety management and EPA risk management plan guidance document for bulk liquid hydrogen supply systems</i>	5 <sup>th</sup> (2022)	Deadline to submit proposed changes for next edition is 08/01/2027. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-49">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-49</a>
CGA PS-31, <i>Position statement on cleanliness for proton exchange membranes hydrogen piping / components</i>	1 <sup>st</sup> (2007 – reaffirmed 2019)	Deadline to submit proposed changes for next edition is 6/12/2025. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-16">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-16</a>
CGA PS-33, <i>Position statement on the use of LPG or propane tanks as compressed hydrogen storage buffers</i>	1 <sup>st</sup> (2008 – reaffirmed 2020)	Deadline to submit proposed changes for next edition is 12/10/2026. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-41">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-41</a>

<b>Standard</b>	<b>Current edition</b>	<b>Status</b>
CGA PS-46, <i>Position statement on roofs over hydrogen storage systems</i>	1 <sup>st</sup> (2017)	The ad hoc committee met on 8 August 2023 to resolve public comments and update PS-46. For updates see the link below: <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-012">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-012</a>
CGA PS-48, <i>Position statement on clarification of existing hydrogen setback distances and development of new hydrogen setback distances in NFPA 55</i>	1 <sup>st</sup> (2016)	The ad hoc committee met on 8 August 2023 to resolve public comments and update PS-48 to point to NFPA 2 for hydrogen instead of pointing to NFPA 55. For updates see the link below: <a href="https://portal.cganet.com/WorkItem/Details.aspx?id=21-062">https://portal.cganet.com/WorkItem/Details.aspx?id=21-062</a>
PS-69, <i>Liquid Hydrogen Supply Systems Separation Distances</i>	1 <sup>st</sup> (2022)	CGA has developed a position statement pointing users to the new liquid hydrogen system distances in NFPA 2:2023. The position statement covers the process of requesting a variance to use the numbers from the NFPA 2 section of the NFPA web site. PS-69 is free for downloading at <a href="https://www.cganet.com/wp-content/uploads/PS-69_1.pdf">https://www.cganet.com/wp-content/uploads/PS-69_1.pdf</a>
CGA work item 21-127, <i>Transfer and unloading of hydrogen at near-consumer use points</i>	New publication not released yet	Develop a new standard to update traditional hydrogen delivery practices for industrial users to improve practices for retail applications.
CGA work item 21-128, <i>Noise from hydrogen venting and hydrogen systems operations</i>	New publication not released yet	Develop a new standard to reduce the noise from hydrogen system operations, including venting, particularly at retail applications where hydrogen system noise is greater than ambient noise. The task force held a meeting November 1 and is working on developing content for the publication.
CGA work item 22-107, <i>Hydrogen system best practices</i>	New publication not released yet	Develop a new standard to capture recommended best practices for handling hydrogen, filling containers, starting up systems, maintaining hydrogen systems, and similar topics to ensure safe practices for those new to the hydrogen space and to share best practices from those already experienced with hydrogen. The first draft was sent out for a two-month membership review with a cutoff date of 15 August 2023. No member comments were received. The draft is now out to CGA Standards Council for review with a deadline of

Standard	Current edition	Status
		13 September 2023. <a href="https://portal.cganet.com/WorkItem/Details.aspx?id=22-107">https://portal.cganet.com/WorkItem/Details.aspx?id=22-107</a>
CGA work item 22-116, <i>Hydrogen separation distances</i>	New publication not released yet	CGA is developing a globally harmonized standard on the methodology for developing separation distances between hydrogen systems and exposures. The standard will provide details on mitigation techniques for reducing required distances, particularly in near-consumer locations (such as vehicular fueling) where room is limited. The working group has a first outline and continues to add content. The JWG met via web conference 5 April 2023, 4 May 2023, 18 May 2023, 8 June 2023, 7 July 2023, 30 August 2023, 29 September 2023, 27 October 2023, and 17 November 2023. Future meetings are 15 December 2023 via web conference and an in-person meeting scheduled for 6-7 February 2024 at CGA headquarters in McLean, VA.
CGA work item 22-127, <i>Hydrogen education plan</i>	New publication not released yet	CGA is developing a globally harmonized standard on hydrogen emergency response and safe hydrogen handling training. The JWG has finished work on the draft document.

### Upcoming events:

CGA has established a new hydrogen membership category for those interested in hydrogen activities and not the whole range of industrial gases. The new membership category has a lower fee structure. More details can be found at <https://www.cganet.com/cga-announces-formation-of-hydrogen-membership/>. Those who are interested are encouraged to review the material at the CGA web site and/or contact Rob Early at [rearly@cganet.com](mailto:rearly@cganet.com).

CGA has launched <https://www.safehydrogenproject.org/> to grow awareness and access to standards and safety information. More details can be found at <https://www.cganet.com/compressed-gas-association-announces-landmark-hydrogen-initiative/>

#### American Society for Testing & Materials (ASTM)

Christina Daniels

- ASTM is currently having its biannual meeting in New Orleans. An update will be provided in January.

#### American Society of Mechanical Engineers (ASME)

Ray Rahaman

- None.



## ASME BPVC

Karen Quackenbush

- The code case is out and is limited to electrolyzer cell stack assemblies
- The task group held its first meeting a week ago and will meet every two months. The next meeting will be on Tuesday, January 23<sup>rd</sup>. To join, please reach out to Karen Quackenbush via email at [kquackenbush@fchea.org](mailto:kquackenbush@fchea.org)

## VI. Discussion Topics

### Center for Hydrogen Safety

Jennifer Hamilton

- The Center for Hydrogen Safety (CHS) is calling for abstracts for its 2024 Center for Hydrogen Safety Americas Conference in Las Vegas, California, on May 21-23, 2024.
  - The deadline for abstracts is January 12, 2024. To submit your abstract, please click [here](#).
- Registration is Open for Venting for Gaseous and Liquid Hydrogen
  - On Tuesday, January 30th, 10am - 11:30am ET, CHS will explore the purpose and importance behind venting systems for both liquid and gaseous hydrogen applications, as well as discussing the difference between venting systems for each. CHS will also cover best safety practices, proper design considerations, and proper operation of these systems. CHS will conclude this webinar with a review of past incidents and lessons learned.
  - To register for free, please click [here](#).
- CHS has started offering NFPA2 Training. <https://www.aiche.org/chs/nfpa2>

### Regulatory Matrix Review and Comment

Karen Quackenbush

- This Matrix is updated quarterly and keeps FCHEA members up-to-date in the development of codes, standards, and regulations.
- As of September 30, 2023:  
<https://static1.squarespace.com/static/5668416ddc5cb4375e2a9ef8/t/6526d8c28822576439a6d948/1697044676664/FCHEA+Regulatory+Matrix+Markup+September+30+2023.pdf>
- Please direct any updates, questions, or comments to Karen Quackenbush via email at [kquackenbush@fchea.org](mailto:kquackenbush@fchea.org) or Haboon Osmond at [hosmond@fchea.org](mailto:hosmond@fchea.org).

### California Station Implementation

Ben Xiong

- 54 open retail stations
- 11 HRS currently unavailable
  - True Zero LAX, Palo Alto, Anaheim
  - Shell Citrus Heights, Berkeley, Sacramento, SF – 3rd St, SF – Harrison St
  - Cummins Ontario
  - Cal State LA
  - Air Products Fairfax-LA
- 5 HRS in commissioning
  - Iwatani Anaheim
  - Iwatani Corona
  - Iwatani La Mirada
  - Iwatani Santa Ana
  - HTEC Woodside

**California Div. of Measurement Standards/Fuel Quality / Metrology**

**Yuk Wong**

- None.

**Legal Metrology Standards Hydrogen Fuel  
Quality and Measurement**

**Juana Williams**

- None.

**VII. Open Discussion & Other Issues**

- a. None.

**VIII. Next Meeting – Thursday, January 11<sup>th</sup> at 2:00 PM US Eastern Time**